Solutions for Second Quiz

COSC 6360
Fall 2015
First question

A system of physical clocks consists of two clocks, namely, one that is slow and loses two minutes every hour and another that is fast and advances by two minutes every hour.

Assuming that the two clocks are managed by Lamport’s physical clock protocol, what will be the time marked by each clock at two o’clock given that:

- Both clocks indicated the correct time at noon;
- The processors on which the clocks resides continuously exchanged messages between themselves from noon to 1 pm then remain silent;
- Message transmission delays are negligible.
## Answer

<table>
<thead>
<tr>
<th>Actual time</th>
<th>Slow clock</th>
<th>Fast clock</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noon</td>
<td>12:00 pm</td>
<td>12:00 pm</td>
</tr>
<tr>
<td>1 pm</td>
<td>1:02 pm</td>
<td>1:02 pm</td>
</tr>
<tr>
<td>2 pm</td>
<td>2:00 pm</td>
<td>2:04 pm</td>
</tr>
</tbody>
</table>
Second question

- What is the main purpose of *Corey kernel shares*?
Answer

- What is the main purpose of *Corey kernel shares*?

  - Kernel shares are lookup tables for kernel objects that allow applications to control which object identifiers are visible to other cores in order *to limit contention*.
Third question

- How does Raft prevent a candidate server that is *not up to date* from ever becoming the new leader of a cluster?
Answer

- How does Raft prevent a candidate server that is *not up to date* from ever becoming the new leader of a cluster?

  - Candidates include in their *RequestVote* RPCs information about the state of their log
  - Before voting for a candidate, servers check that the log of the candidate is at least as up to date as their own log.
Fourth question

- What is the main motivation for initiating the *speculative demotion* of a superpage?
Answer

- What is the main motivation for initiating the *speculative demotion* of a superpage?

  - Speculative demotion lets the system find out which parts of a superpage are still active
    - Allows the system to monitor access to individual pages
Fifth question

- In the ARC cache replacement policy, which events result in an update of `target_T1`?
  - Target_T1 will increase when
  - Target_T1 will decrease when
Answer

- In the ARC cache replacement policy, which events result in an update of `target_T1`?

  - `Target_T1 will increase when` a page in `B1` causes a page fault.

  - `Target_T1 will decrease when` a page in `B2` causes a page fault.
Sixth question

What *must happen* before Proof Carrying Code becomes widely used?
Answer

- What *must happen* before Proof Carrying Code becomes widely used?
  - We must find a *cost-effective way* to construct *safety proofs* for non-trivial extensions.
Seventh question

What is the major performance penalty occurring when Nooks crosses a *lightweight protection domain boundary*?
Answer

- What is the major performance penalty occurring when Nooks crosses a lightweight protection domain boundary?

  - Crossing protection boundaries requires switching the kernel page table, which results in a flush of the current TLB (and an avalanche of TLB misses).